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CLAIMS

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1. A process for obtaining a solid catalyst component for ethylene polymerization and copolymerization, wherein a carrier of particulate silica (65 to 85% by weight) is impregnated with a catalytically active portion (15 to 35% by weight) including titanium, magnesium, chlorine, alkoxy groups and at least one organometallic compound of the groups 1, 2, 12 or 13 of the periodic table, the process comprising the steps of:

(a) impregnating an activated particulate silica in particles using a solution of an organometallic compound of the groups 1, 2, 12 or 13 of the periodic table in an amount ranging from 0.1 to 1 mmole of the organometallic solution per mmole of OH on the silica surface, in an inert organic solvent;

(b) removing the supernatant liquid from the step (a);

(c) preparing a solution obtained by reacting at least one magnesium compound, selected from magnesium halides and magnesium alkoxides, in an amount ranging from 0.0024 to 0.24 g of magnesium per g of silica, and at least one titanium compound, selected from titanium alkoxides and titanium halogen alkoxides, in an amount ranging from 0.01 to 1 g of titanium per g of silica;

(d) impregnating the silica obtained on (b) using the solution prepared in (c);

(e) optionally reacting the solid obtained in (d) with a reducing agent which acts on the titanium centre compound;

(f) reacting the solid obtained in (d) or (e) with a halogenating agent capable of acting on the alkoxide compounds;

(g) maintaining the solid obtained in (f) at a temperature from 60°C to 120°C from 0.5 hour to 5 hours;

(h) washing the solid obtained in (g) with an inert organic solvent;

(i) optionally washing the solid obtained in (h) with a solution of one or more organometallic compounds of the groups 1, 2, 12 or 13 of the periodic

table in an amount ranging from 0 to 3 g of the organometallic compound per g of the dry catalyst component obtained.

2. A process for obtaining a solid catalyst component according to claim 1, wherein the activated particulate silica used in step (a) is a microspheroidal, porous silica.

3. A process for obtaining a solid catalyst component according to claim 1 or 2, wherein the activated particulate silica used in step (a) has an average particle size (diameter) ranging from 10 to 120 μm .

4. A process for obtaining a solid catalyst component according to claim 3, wherein the average particle size (diameter) ranges from 40 to 70 μm .

5. A process for obtaining a solid catalyst component according to any one of claims 1 to 4, wherein the activated particulate silica used in step (a) has a surface area (B.E.T.) ranging from 250 to 500 m^2/g .

6. A process for obtaining a solid catalyst component according to claims 1 to 5, wherein the activated particulate silica used in step (a) has a pore volume (B.E.T.) ranging from 1.0 to 2.0 ml/g .

7. A process for obtaining a solid catalyst component according to claim 1, wherein the organometallic compounds of groups 1, 2, 12 or 13 of the periodic table used in step (a) is trimethylaluminum, triethylaluminum (TEAL), methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), tri-n-hexylaluminum (Tn-HAL), tri-n-octylaluminum (TnOAL), butyl ethylmagnesium (BEM), butyl octylmagnesium (BOMAG), methylmagnesium chloride or ethylmagnesium chloride.

8. A process for obtaining a solid catalyst component according to claim 1, wherein the amount of the solution of organometallic compound of the

groups 1, 2, 12 or 13 of the periodic table in step (a) ranges from 0.3 to 0.7 mmole of the organometallic solution per mmole of OH on the silica surface.

9. A process for obtaining a solid catalyst component according to claim 1, wherein the supernatant liquid from step (a) is removed by means of usual
5 methods such as settling and siphoning, filtration or centrifugation.

10. A process for obtaining a solid catalyst component according to claim 1, wherein the magnesium compound used to prepare the solution of the step (c) is magnesium dichloride, magnesium diethylate, magnesium di-n-butylate, magnesium diisopropylate or magnesium diisobutylate.

10 11. A process for obtaining a solid catalyst component according to claim 1 or 10, wherein the magnesium compound used to prepare the solution of the step (c) is in an amount ranging from 0.0042 to 0.042 g of magnesium per g of silica.

12. A process for obtaining a solid catalyst component according to claim 1,
15 wherein the titanium compound used to prepare the solution of the step (c) is titanium tetra-n-propylate, titanium tetra-n-butylate, titanium tetra-i-propylate, titanium tetra-i-butylate or the corresponding titanium mono- or di-chloroalkoxides.

13. A process for obtaining a solid catalyst component according to claim 1 or
20 12, wherein the titanium compound used to prepare the solution of the step (c) is in an amount ranging from 0.0175 to 0.175 g of titanium per g of silica.

14. A process for obtaining a solid catalyst component according to any one of claims 1, 11 or 13, wherein the molar ratio Ti/Mg used to prepare the solution of the step (c) is comprised between 0.3 and 4.

25 15. A process for obtaining a solid catalyst component according to claim 1, wherein the reducing agent used in the step (e) is Na-alkyl, Li-alkyl, Zn-alkyl, Mg-alkyl and corresponding aryl-derivatives, Grignard compounds of the type RMgX or polyhydrosiloxanes.

16. A process for obtaining a solid catalyst component according to claim 1 or 15, wherein the reducing agent used in the step (e) is $(\text{CH}_3)_3\text{SiO}-[(\text{CH}_3)\text{HSiO}]_n\text{Si}(\text{CH}_3)_3$, wherein n varies from 1 to 35, $(\text{CH}_3\text{HSiO})_4$, $(\text{CH}_3\text{HSiO})_3$, $\text{H}_3\text{Si-O-SiH}_2\text{-OSiH}_3$ or phenylhydropolysiloxanes in which the hydrogen atoms can be partially replaced by methyl groups.

17. A process for obtaining a solid catalyst component according to claim 1 or 15 or 16, wherein the reducing agent used in the step (e) is in an amount ranging from 0 to 2 moles per mole of titanium.

18. A process for obtaining a solid catalyst component according to claim 17, wherein the reducing agent is in an amount ranging from 0 to 0.1 moles per mole of titanium.

19. A process for obtaining a solid catalyst component according to claim 1, wherein the halogenating agent used in the step (f) is methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), SiCl_4 , SnCl_4 , HCl , Cl_2 , HSiCl_3 , aluminum chloride, ethylboron dichloride, boron chloride, diethylboron chloride, HCCl_3 , PCl_3 , POCl_3 , acetyl chlorides, thionyl chloride, sulfur chloride, methyl trichlorosilane, dimethyl dichlorosilane, TiCl_4 , VCl_4 , CCl_4 , t-butyl chloride, n-butyl chloride, chloroform, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane or dichloromethane.

20. A process for obtaining a solid catalyst component according to claim 19, wherein the halogenating agent is SiCl_4 , SnCl_4 , HCl , Cl_2 , HSiCl_3 , methyl trichlorosilane, dimethyl dichlorosilane, t-butyl chloride, n-butyl chloride, chloroform, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane or dichloromethane.

21. A process for obtaining a solid catalyst component according to claim 20, wherein the halogenating agent is SiCl_4 .

22.A process for obtaining a solid catalyst component according to claim 1 or 19 or 20 or 21, wherein the halogenating agent used in the step (f) is used in an amount ranging from 0.5 to 3 moles of halogenating agent per mole of titanium.

5 23.A process for obtaining a solid catalyst component according to claim 1, wherein the thermal treatment of the step (g) is conducted from 3 hour to 5 hours and at a temperature from 60°C to 75°C.

24.A process for obtaining a solid catalyst component according to claim 1, wherein the solid in step (h) is separated from the suspension by means of
10 usual methods such as settling and siphoning, filtration or centrifugation.

25.A process for obtaining a solid catalyst component according to claim 1, wherein the amount of the solution of one or more organometallic compounds of the groups 1, 2, 12 or 13 of the periodic table used in step (i) ranges from 0.05 to 1 g of the organometallic compound per g of the dry
15 catalyst component obtained.

26.A process for obtaining a solid catalyst component according to claim 1, wherein two different organometallic compounds are used in the step (i) to wash the solid obtained in step (h).

27.A process for obtaining a solid catalyst component according to claim 1 or
20 18, wherein the two different organometallic compounds in the step (i) are fed together, mixed in the same solution.

28.A process for obtaining a solid catalyst component according to claim 1 or 18, wherein the two different organometallic compounds in the step (i) are fed at the same time, in individual solutions.

25 29.A process for obtaining a solid catalyst component according to claim 1 or 18, wherein the two different organometallic compounds in the step (i) are fed one after the other, in individual solutions.

30.A process for obtaining a solid catalyst component according to claims 1 or any one of claims 25 to 29, wherein the organometallic compound used in

the step (i) is methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), tri-n-hexylaluminum (Tn-HAL) or tri-n-octylaluminum (TnOAL).

31.A process for obtaining a solid catalyst component according to claim 1, wherein the inert organic solvent used is hexane, heptane, octane or isoparaffin.

32.A solid catalyst component with high activity and low decay kinetics for ethylene polymerization and copolymerization, obtained by the process as described in any one of the claims 1 to 31, wherein it comprises a carrier of particulate silica and a catalytically active portion including 0.005 to 0.02 g of titanium per g of solid catalyst, 0.003 to 0.03 g of magnesium per g of solid catalyst, chlorine, alkoxy groups and at least one organometallic compound of the groups 1, 2, 12 or 13 of the periodic table in an amount ranging from 0.003 to 0.03 g of metal per g of solid catalyst.

33.A solid catalyst component according to claim 32, wherein the solid catalyst component morphology is spheroidal.

34.A solid catalyst component according to claim 32, wherein the solid catalyst has an average particle size (diameter) ranging from 10 to 120 μm .

35.A solid catalyst component according to claim 32, wherein the solid catalyst has a surface area (B.E.T.) ranging from 80 to 300 m^2/g .

36.A solid catalyst component according to claim 32, wherein the solid catalyst has a pore volume (B.E.T.) ranging from 0.1 to 1.0 ml/g .

37.A solid catalyst component according to claim 32, wherein the magnesium is present in an amount ranging from 0.01 to 0.02 g of magnesium per g of solid catalyst.

38.A solid catalyst component according to claim 32, wherein the titanium is present in an amount ranging from 0.015 to 0.02 g of titanium per g of solid catalyst.

39.A solid catalyst component according to claim 32, wherein the organometallic compound of the groups 1, 2, 12 or 13 of the periodic table is present in an amount ranging from 0.01 to 0.025 g of metal per g of solid catalyst.

40.A solid catalyst component according to claim 32 or 39, wherein the organometallic compound of the groups 1, 2, 12 or 13 of the periodic table is an organo-aluminum, an organo-magnesium, an organo-lithium or an organo-zinc compound.

41.A solid catalyst component according to claim 32, wherein the alkoxy groups is present in an amount ranging from 0.03 to 0.08 g of alkoxy groups per g of solid catalyst.

42.A solid catalyst component according to claim 32 or 41, wherein the alkoxy groups is n-propoxy, i-propoxy, n-butoxy or i-butoxy.

43.A solid catalyst component according to claim 32, wherein the chlorine is present in an amount ranging from 0.05 to 0.12 g of chlorine atoms per g of solid catalyst.

44.A process for ethylene polymerization and copolymerization using the catalyst according to one or more of the claims 32 to 43.

45.A process for ethylene polymerization and copolymerization according to claim 44, wherein it is carried out in gas phase.

46.Process for ethylene polymerization and copolymerization according to claim 44 wherein the co-catalyst used in the polymerization process is an alkyl aluminum.

47.Process for ethylene polymerization and copolymerization according to claims 44 or 46 wherein the co-catalyst used in the polymerization process is trimethyl aluminum or triethyl aluminum.

48. Process for ethylene polymerization and copolymerization according to claims 44, 46 or 47 wherein mass ratio co-catalyst:catalyst in the polymerization process is between 0.5:1 and 6:1.

49. A process for ethylene polymerization and copolymerization according to claim 44, wherein the catalyst is fed in dry bulk powder, in paste, in oil suspension or in solvent suspension.

50. A process for ethylene polymerization and copolymerization according to claim 44, wherein the catalyst is fed directly into the polymerization reactor.

51. A process for ethylene polymerization and copolymerization according to claim 44, wherein the catalyst is prepolymerized before being fed into the polymerization reactor.

52. A process for ethylene polymerization and copolymerization according to claims 44, wherein the catalyst is prepolymerized with ethylene or propylene before being fed into the polymerization reactor.

53. Ethylene homo or copolymer obtained by the process according to any one of claims 44 to 52.

54. Ethylene homo or copolymer according to claim 53, wherein it has controlled morphology and improved properties.

55. Ethylene homo or copolymer according to claim 53 or 54, wherein the particles of ethylene homo and copolymers have high bulk density.

56. Ethylene homo or copolymer according to claim 55, wherein the bulk density is greater than or equal to 0.38 g/cm^3 .

57. Ethylene homo or copolymer according to any one of claims 53 to 56, wherein the particles of ethylene homo and copolymers contain a very small quantity of fines.

58. Ethylene homo or copolymer according to claim 57, wherein the quantity of fines ($\leq 250 \mu\text{m}$) is lower than or equal to 1% per weight.

59. Ethylene copolymer according to any one of claims 53 to 58, wherein it is a linear medium or linear low density polyethylene having a density lower than 0.940 g/cm^3 .
60. Ethylene copolymer according to claim 59, wherein the linear medium or linear low density polyethylene has a density lower than 0.920 g/cm^3 .
61. Ethylene copolymer according to claim 59 or 60, wherein the linear medium or linear low density polyethylene has a low xylene soluble content.
62. Ethylene copolymer according to claim 61, wherein the xylene soluble content is lower than or equal to 10%.
63. Ethylene homo copolymer according to any one of claims 53 to 58, wherein it is a high density polyethylene having density greater than 0.940 g/cm^3 .
64. Ethylene homo copolymer according to any one of claims 53 to 63, wherein the polyethylene has a narrow molecular weight distribution.
65. Ethylene homo copolymer according to any one of claims 53 or 64, wherein the polyethylene has a melt flow ratio (MFR) lower than 27.